

Infection by *Microsporum canis* in Paediatric Patients: A Veterinary Perspective

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Abstract

Microsporum canis is a dermatophyte fungus of which cats and dogs are recognized as the natural hosts. *M. canis* is also easily transmitted to humans, causing lesions to the glabrous skin (tinea corporis) and to the head (tinea capitis). The present study describes some cases of infection with *M. canis* in children from a veterinary perspective, highlighting some important features of this clinical entity (e.g., the necessity to identify the animal source of infection with appropriate diagnostic tests; the fact that infected cats may present with no or atypical dermatological signs; and the importance of the environment as a fungal reserve).

1. Introduction

Microsporum canis belongs to the group of dermatophyte fungi, which are closely related organisms that have the ability to invade the stratum corneum of the epidermis and keratinized tissues derived from it, such as skin, nails, and hair of humans and animals. These fungi produce an infection called dermatophytosis, commonly referred to as ringworm or tinea [1,2]. *M. canis* is the most common dermatophyte in cats and dogs, with cats considered to be the most important reservoir hosts. This organism has also been occasionally reported in a number of other domestic and wild animals [2,3,4,5]. *M. canis* is known to mainly reproduce asexually through a mitotic process, and the propagules that originate from the asexual reproduction (conidia) vary according to the context in which the fungus is located. During hair/scale invasion, hyphae are fragmented to produce masses of small arthroconidia, which represent the infective parts of the fungus [6]. In culture plates, fungal reproduction yields spindle-shaped macro-conidia and one-celled microconidia [2,6].

M. canis is widespread worldwide (particularly in Europe, the eastern Mediterranean, and South America) and plays an important zoo-

notic role. *M. canis* is a very frequent agent of tinea capitis, mainly in children, and can also cause highly inflamed lesions on glabrous skin (tinea corporis and tinea faciei) [1]. This study describes some cases of *M. canis* infection involving paediatric patients from a veterinary perspective.

2. Materials and Methods

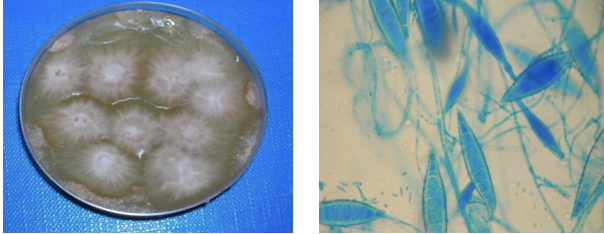
The cases in this study involved animals taken for examination in two veterinary clinics in northern Italy (the veterinary clinic of the Department of Veterinary Sciences of Turin and a private veterinary clinic in the Cuneo province). The examination was requested because children in contact with the animals had developed tinea corporis due to *M. canis*.



Tinea corporis due to *M. canis* in a child (case # 3).

For each animal, a complete clinical examination was performed. The animals were sampled using the tooth-brush technique [6], where a toothbrush is combed over the entire hair coat to accumulate hair and keratin debris and is then pressed onto the surface of a culture plate. Contact plates (Rodac, PBI International S.P.A., Milano, Italy) were employed to evaluate the fungal contamination inside the homes of provenance. In the different rooms (kitchen, bathroom, living room, bedroom), a series of plates were pressed on floors, pieces of furniture (tables, sofa, beds, etc.), and various objects (curtains, carpets, towels, etc.). The growth medium used

for the cultures was Mycobios Selective Agar (Biolife, Milano, Italy). Plates were incubated at 25 °C and examined daily for 2 weeks. Fungal colonies were identified to species level based on their morphology and microscopic features.



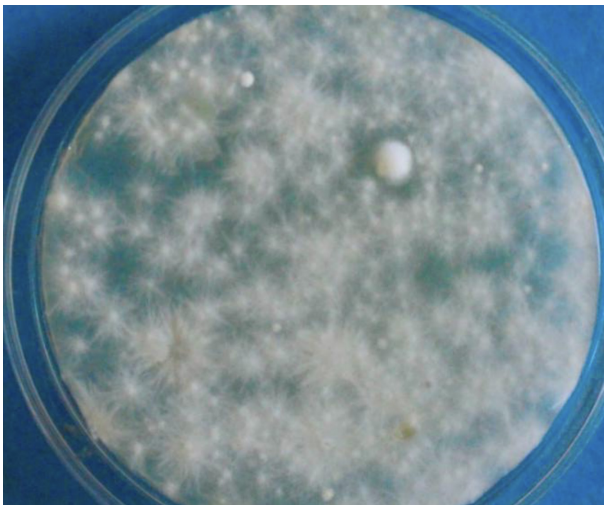
(a) Colonies of *M. canis* in culture; (b) Microscopic aspect, macro- and micro-conidia.

3. Results

3.1. Case 1 (April, 2014)

The source of infection (SOI) was demonstrated to be a stray kitten that had been adopted. The cat had no evidence of clinical lesions.

Heavy environmental contamination was also detected.



Environmental sample (contact plate from sofa, case # 1). Widespread growth of colonies of *M. canis*.

The cat was successfully treated using itraconazole with oral therapy (Itrafungol®, Elanco Italia S.p.A., Sesto Fiorentino, Italy) and miconazole (Demicol®, Ceva Salute Animale S.p.A., Agrate Brianza, Italy) with topical therapy. Environmental decontamination was performed by vacuuming to remove infected hairs (with subsequent disinfection of the vacuum cleaner); washing of surfaces and objects with household bleach where possible (e.g., floors in the bathroom or in the kitchen) or enilconazole spray (Clinafarm, Elanco Italia S.p.A, Sesto Fiorenti-

no, Italy); and disinfecting of washable textiles via mechanical washing. Contamination was monitored over time, and cleaning procedures were stopped when fungal culture results were negative.

3.2. Case 2 (March, 2016)

The SOI was a pure-breed cat (*Sphynx*) purchased from a breeder. The sole clinical abnormality was the presence of pigmented areas that disappeared after antifungal therapy (itraconazole + topical miconazole). Heavy environmental contamination was also demonstrated. Frequent vacuuming was recommended to remove gross debris, followed by cleaning of surfaces and objects using a peroxidisulfate formulation containing an anionic surfactant and organic acids (VI-SEPT Tablets, Medicaline) until culture results were negative. Washable textiles were disinfected via mechanical washing using the same product (VI-SEPT Tablets, Medicaline S.r.l, Monfalcone, Italy).

3.3. Case 3 (May, 2017)

A guinea pig kept as a pet by the family was presented as the probable cause of infection by *M. canis*. The animal had no evidence of dermatological lesions.

However, fungal cultures from the animal and the environment were negative. The parents reported that 2 weeks previously the child had attended a birthday party in a park during which he had played with a stray cat.

4. Discussion

During recent years, the incidence of *M. canis* infection in humans has strongly increased in Europe [7,8]. In particular, this dermatophyte is now considered one of the most prevalent causes of tinea capitis in children [8]. Outbreak episodes of children presenting with tinea corporis have been described in different publications, some of which date back to several years ago [9,10,11,12].